Earth's Structure and Processes

8-3 The student will demonstrate an understanding of materials that determine the structure of Earth and the processes that have altered this structure. (Earth Science)

8-3.1 Summarize the three layers of Earth – crust, mantle, and core – on the basis of relative position, density, and composition.
Taxonomy level: 2.4-B Understand Conceptual Knowledge

Previous/future knowledge: Students in 3rd grade (3-3.5, 3-3.6) focused on Earth's surface features, water, and land. In 5th grade (5-3.2), students illustrated Earth's ocean floor. The physical property of density was introduced in 7th grade (7-5.9). Students have not been introduced to areas of Earth below the surface. Further study into Earth's internal structure based on internal heat and gravitational energy is part of the content of high school Earth Science (ES-3.2).

It is essential for students to know that Earth has layers that have specific conditions and composition.

Layer	Relative Position	Density	Composition
Crust	Outermost layer; thinnest under the ocean, thickest under continents; crust & top of mantle called the *lithosphere*	Least dense layer overall; Oceanic crust (basalt) is more dense than continental crust (granite)	Solid rock – mostly silicon and oxygen Oceanic crust - basalt; Continental crust - granite
Mantle	Middle layer, thickest layer; top portion called the *asthenosphere*	Density increases with depth because of increasing pressure	Hot softened rock; contains iron and magnesium
Core	Inner layer; consists of two parts – outer core and inner core	Heaviest material; most dense layer	Mostly iron and nickel; outer core – slow flowing liquid, inner core - solid

It is not essential for students to know specific depths or temperatures of the layers. Students do not need to explain the heat transfer systems within the layers.

Assessment Guidelines:
The objective of this indicator is to *summarize* major points about the layers of Earth; therefore, the primary focus of assessment should be to generalize major points about the crust, mantle, and core of Earth. However, appropriate assessments should also require students to *compare* the layers; *classify* by sequencing the layers using property information; or *identify* the layer with a certain set of properties.